

**What is claimed is:**

1. A method performed by a user equipment in wireless communication systems, for switching from P2P (Peer\_to\_Peer) communication mode to UP-UTRAN-DOWN communication mode (called as conventional mode), comprising  
5 steps of:

(a)detecting the direct link used by the user equipment in P2P communication with the other user equipment;

(b)sending a request for switching to conventional communication mode to a wireless communication network system, if the detecting result indicates that the  
10 communication quality of the direct link can't satisfy the requirement for P2P communication; and

(c)establishing conventional communication connection to communicate with said the other user equipment in conventional communication mode, after receiving acknowledge (ACK) message of the request for switching sent by the  
15 network system.

2. The method according to claim 1, wherein step (c) includes:

(c1)entering concurrent state of P2P communication and conventional communication, after receiving the ACK message of the request for switching sent by the network system and acquiring the allocated conventional communication  
20 mode traffic channel;

(c2)testing the acquired traffic channel in conventional communication mode after entering concurrent state;

(c3)sending a request for releasing P2P communication radio resource to the network system if the testing result indicates that the communication quality of the  
25 traffic channel in conventional communication mode can satisfy the requirement for conventional communication; and

(c4)releasing the radio resource occupied by the direct link so that the user equipment can switch from the concurrent state to single conventional communication mode after receiving the ACK message of the request for releasing  
30 P2P communication radio resource sent by the network system.

3. The method according to claim 2, wherein the user equipment can send said request for switching to conventional communication mode and said request

for releasing P2P communication radio resource to the network system, via any channel of the uplink control channel and the customized uplink channel.

4. The method according to claim 1, 2 or 3, wherein step (b) includes:

5 (b1)testing the communication quality of said direct link at every other certain interval and acquiring the corresponding testing result, if the detecting result indicates that the communication quality of said direct link is under a predefined value;

(b2)computing the communication quality of said direct link in the interval according to the acquired testing result in the predetermined interval; and

10 (b3)sending said request for switching to conventional communication mode to the network system if the computed result indicates that the communication quality of said direct link can't satisfy the requirement for P2P communication.

5. The method according to claim 4, further comprising:

15 (b4)continuing with P2P communication mode if the computed result indicates that the communication quality of said direct link can satisfy the requirement for P2P communication.

6. The method according to claim 2, wherein step (c2) includes:

20 (c21)testing the communication quality of the traffic channel in said conventional communication mode at every other certain interval and acquiring the corresponding testing result, after entering concurrent state; and

(c22)computing to get the communication quality of said traffic channel in conventional communication mode in the interval, according to the testing result acquired in the predetermined interval.

7. The method according to claim 6, further comprising:

25 counting the number of computing the communication quality of said traffic channel in conventional communication mode in said interval; and

testing and computing the communication quality of said conventional communication mode traffic channel in said interval again after increasing the number, if the number doesn't exceed a predefined value.

30 8. The method according to claim 7, further comprising:

continuing with P2P communication mode if said number exceeds a

predefined value.

9. The method according to any one of claims 1 to 3, wherein the traffic channel of direct communication link can be taken as one of uplink traffic channel and downlink traffic channel in conventional communication mode.

5 10. A method performed by the wireless communication network system in wireless communication systems, for switching user equipments from P2P (Peer to Peer) communication mode to UP-UTRAN-DOWN communication mode (called as conventional communication mode), comprising:

10 (A) receiving requests from UE in P2P communication mode for switching to conventional communication mode;

(B) responding to the requests for switching to conventional communication mode and allocating traffic channel in conventional communication mode to the two user equipments in P2P communication mode; and

15 (C) sending ACK messages of the requests for switching to the two user equipments, so that the two user equipments can establish conventional communication connection.

11. The method according to claim 10, wherein further comprising:

(D) receiving requests for releasing P2P communication radio resource from the two user equipments; and

20 (E) responding to the requests for releasing P2P communication radio resource and reclaiming the P2P communication radio resource; and

25 (F) sending ACK messages of the requests for releasing P2P communication radio resource to the two user equipments, so that the two user equipments can switch from said concurrent state to single conventional communication mode, after reclaiming the P2P communication radio resource.

12. The method according to claim 10 or 11, wherein the conventional communication mode traffic channel allocated by said network system to the two user equipments, at least contains one of the downlink traffic channel and the uplink traffic channel.

13. A method performed by a user equipment for switching from UP\_UTRAN\_DOWN (called as conventional communication mode) to P2P communication mode, comprising:

5 (a)receiving control information from the wireless communication network system;

(b)overhearing the information transferred on the uplink between the network system and said the other user equipment communicating with the user equipment in conventional communication , according to the control information;

10 (c)detecting whether the user equipment can overhear the information transferred on the uplink, to determine whether the communication quality of the uplink can satisfy the requirement for P2P communication between the other user equipment and the user equipment;

15 (d)establishing P2P connection with the other user equipment by using the uplink, so that the user equipment can communicate with the other user equipment in P2P communication mode, if the detecting result indicates that the uplink can satisfy the quality requirement for P2P communication.

14. The method according to claim 13, wherein step (d) includes:

20 (d1)sending a notification message to the network system if the detecting result indicates that the uplink can satisfy the quality requirement for P2P communication; and

(d2)establishing P2P connection with said the other user equipment, according to the instruction message from the network system for establishing P2P connection.

15. The method according to claim 14, wherein step (d2) includes:

25 (d21)establishing P2P connection with the other user equipment and entering concurrent state of P2P communication and conventional communication, according to the instruction message for establishing P2P connection from the network system;

(d22)testing the established P2P link after entering concurrent state;

30 (d23)sending a request for releasing conventional communication radio resource to the network system, if the testing result shows that the communication quality of the P2P link can satisfy the requirement for P2P communication; and

(d24)releasing the radio resource occupied by the conventional link so that the user equipment can switch from the concurrent state of P2P communication and conventional communication to single P2P communication mode, after receiving the ACK message of the request for releasing conventional communication radio resource sent by the network system.

5           16. The method according to claim 13, 14 or 15, wherein step (c) includes:  
          (c1)testing the quality of the overheard uplink at every other certain interval and acquiring the corresponding testing result; and  
          (c2)computing the communication quality of the overheard uplink in the  
10       interval, according to the testing result acquired in the predetermined interval.

          17. The method according to claim 13, further comprising:  
          (e)continuing with conventional communication mode if the testing result indicates that the uplink can't satisfy the quality requirement for P2P communication.

15           18. The method according to claim 15, wherein step (d22) includes:  
          (d221)testing the communication quality of said P2P link at every other certain interval and acquiring the corresponding testing result after entering concurrent state; and  
          (d222)computing to get the communication quality of said P2P link in the  
20       interval according to the testing result acquired in the predetermined interval.

          19. The method according to claim 18, further comprising:  
          counting the number of computing the communication quality of said P2P link in said interval; and  
          testing and computing the communication quality of said P2P link in said  
25       interval again after increasing the number, if the number doesn't exceed a predefined value;

          20. The method according to claim 19, further comprising:  
          continuing with conventional communication mode if said number exceeds a predefined value.

30           21. A method performed by the wireless communication network system in wireless communication systems for the user equipment to switch from

UP\_UTRAN\_DOWN (conventional communication mode) to P2P communication mode, comprising:

(a) determining whether the two user equipments satisfy the condition of establishing P2P communication;

5 (b) sending control information to the two user equipments respectively to instruct them to overhear information transferred on the uplink between their peers and the network system, if the two user equipments satisfy the condition of establishing P2P communication;

10 (c) receiving notification messages from the two user equipments, which indicate that each of the two user equipments can overhear information transferred on the uplink between its peer and the network system; and

(d) sending instruction messages to the two user equipments respectively to instruct them to establish mutual P2P communication.

22. The method according to claim 21, further comprising:

15 (e) receiving requests for releasing conventional communication radio resource from the two user equipments; and

(f) sending ACK messages of the requests for releasing conventional communication radio resource to the two user equipments respectively, so that the two user equipments respectively switch from the concurrent state of P2P communication and conventional communication to single P2P communication mode.

23. The method according to claim 21 or 22, wherein step (a) includes:

25 (a1) determining whether the distance between the two user equipments falls within the scope of P2P communication, according to the position information of said two user equipments;

(a2) determining whether the two user equipments both have P2P communication capability;

(a3) determining whether the two user equipments camp in the same cell; and

30 (a4) determining that P2P communication can be established between the two user equipments when the two user equipments satisfy the conditions of step (a1), (a2) and (a3) concurrently.

24. The method according to claim 23, wherein the position information of said user equipments can be acquired according to one of the information acquired by searching and positioning the user equipments and the information sent by the user equipments to the network system.

5        25. A user equipment capable of switching from P2P communication mode to UP\_UTRAN-DOWN (conventional communication mode) in wireless communication systems, comprising:

        a direct link detecting means, for detecting the direct link for P2P communication between the user equipment and the other user equipment;

10        a switching request sending means, for sending a request for switching to conventional communication mode to a wireless communication network system when the detecting result indicates that the communication quality of the direct link can't satisfy the requirement for P2P communication; and

        a conventional communication connection establishing means, for  
15 establishing connection of conventional communication to communicate with the other user equipment in conventional communication mode after receiving the ACK message of the request for switching sent by the network system.

26. The user equipment according to claim 25, wherein said conventional communication connection establishing means includes:

20        a concurrent state accessing means, for entering concurrent state of P2P communication and conventional communication after receiving the ACK message of the request for switching sent by the network system and acquiring the allocated traffic channel in conventional communication mode;

        a conventional link testing means, for testing the acquired traffic channel in  
25 conventional communication mode after entering concurrent state; and

        a radio resource releasing means, for releasing the radio resource occupied by the direct link so that the user equipment can switch from the concurrent state to single conventional communication mode after receiving the ACK message of the request for releasing the radio resource sent by the network system;

30        wherein said sending means sends a request for releasing P2P communication radio resource to the network system when the testing result of the conventional link testing means shows that the traffic channel in conventional

communication mode can satisfy the quality requirement for conventional communication.

27. The user equipment according to claim 25 or 26, wherein said switching request sending means includes:

5       a testing means, for testing the communication quality of said direct link at every other certain interval and acquiring the corresponding testing result when the detecting result indicates that the communication quality of said direct link is below a predefined value;

10       a computing means, for computing the communication quality of said direct link in the interval according to the acquired testing result in the predetermined interval; and

15       a sending means, for sending said request for switching to conventional communication mode to the network system when said computed result shows that the communication quality of said direct link can't meet the requirement for P2P communication.

28. The user equipment according to claim 26, wherein said conventional link testing means includes:

20       a traffic channel testing means, for testing the communication quality of said traffic channel in conventional communication mode at every other certain intervals and acquiring the corresponding testing result after entering concurrent state; and

25       a traffic channel communication quality computing means, for computing to get the communication quality of said traffic channel in conventional communication mode according to the testing result acquired in the predetermined interval.

29. A wireless communication network system, capable of performing a method for the user equipment to switch from P2P communication mode to UP-UTRAN-DOWN (conventional communication mode), comprising:

30       a receiving means, for receiving the request from the UE in P2P communication mode for switching to conventional communication mode;

      an allocating means, for responding to the request for switching to conventional communication mode and allocating traffic channel in conventional



communication mode to the two user equipments in P2P communication mode;  
and

5 a sending means, for sending ACK messages of the requests for switching to the two user equipments so that convention communication connection between the two user equipments can be established, and sending ACK messages of the requests for releasing P2P communication radio resource so that the two user equipments can switch from concurrent state of P2P communication and conventional communication to single conventional communication mode.

10 30. The network system according to claim 29, further comprising:

a P2P communication radio resource reclaiming means, for reclaiming P2P communication radio resource when said receiving means receives requests for releasing P2P communication radio resource from the two user equipments.

15 31. A user equipment in wireless communication systems, capable of switching from UP\_UTRAN-DOWN (conventional communication mode) to P2P communication mode, comprising:

a receiving means, for receiving control information from the wireless communication network system;

20 an overhearing means, for overhearing information transferred on the uplink between the network system and the other user equipment communicating in conventional communication with the user equipment , according to the control information;

25 a detecting means, for detecting whether information transferred on the uplink can be overheard, so as to determine whether the communication quality of the uplink can satisfy the requirement for P2P communication between the user equipment and the other user equipment; and

30 a P2P connection establishing means, for establishing P2P connection with the other user equipment by using the uplink, so that the user equipment can communicate with said the other user equipment in P2P mode when the detecting result shows that the uplink satisfies the quality requirement for P2P communication.

32. The user equipment according to claim 31, wherein said P2P connection establishing means includes:

a sending means, for sending a notification message to the network system when detecting result shows that the uplink satisfies the quality requirement for P2P communication; and

5 an establishing means, for establishing P2P connection with said the other user equipment according to instruction messages for establishing P2P connection from the network system.

33. The user equipment according to claim 32, wherein said establishing means includes:

10 a concurrent state entering means, for establishing P2P connection with the other user equipment and entering concurrent state of P2P communication and conventional communication from conventional communication mode, according to instruction messages for establishing P2P connection from the network system;

15 a P2P link testing means, for testing the established P2P link after entering concurrent state, wherein said sending means sends a request for releasing conventional communication radio resource to the network system when the testing result of the P2P link testing means shows that the communication quality of the P2P link can satisfy the requirement for P2P communication; and

20 a radio resource releasing means, for releasing the radio resource occupied by the conventional link so that the user equipment can switch from the concurrent state of P2P communication and conventional communication to single P2P communication mode, after said receiving means receives the ACK message of the request for releasing conventional communication radio resource sent by the network system.

25 34. The user equipment according to claim 31, 32 or 33, wherein said detecting means includes:

an uplink testing means, for testing the quality of the overheard uplink once every certain interval and acquiring the corresponding testing result; and

30 a computing means, for computing the communication quality of the overheard uplink in the interval according to the acquired testing result in the predetermined interval.

35. The user equipment according to claim 33, wherein said P2P link testing means includes:

a P2P link testing result acquiring means, for testing the communication quality of said P2P link once every certain interval and acquiring the corresponding result after entering concurrent state; and

5 a P2P link computing means, for computing to get the communication quality of said P2P link in the interval according to the acquired testing result in the predetermined interval.

10 36. A wireless communication network system in wireless communication systems, capable of performing a method for the user equipment to switch from UP\_UTRAN\_DOWN (conventional communication) to P2P communication mode, comprising:

a determining means, for determining whether the two user equipments satisfy the requirement for establishing P2P communication;

15 an instructing means, for sending control information to the two user equipments respectively to instruct them to overhear information transferred on the uplink between their peers and the network system, when it's determined that the two user equipments satisfy the requirement for establishing P2P communication;

20 a receiving means, for receiving notification messages and requests for releasing conventional communication radio resource from the two user equipments, wherein the notification messages show that each of the two user equipments can overhear information transferred on the uplink between its peer and the network system; and

25 a sending means, for sending instruction messages to the two user equipments to instruct them to establish mutual P2P communication and sending ACK messages of the requests for releasing conventional communication radio resource to the two user equipments, so that the two user equipments can respectively switch from the concurrent state of P2P communication and conventional communication to single P2P communication mode.